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ON THE INFLUENCE OF BARYONIC RESONANCES ON THE DYNAMICS OF KAONS*

Ch. Hartnack,Ch. David, F. Arleo and J. Aichelin

Laboratoire de Physique Subatomique
et des Technologies Associées (SUBATECH)
Ecole des Mines de Nantes, University of Nantes, CNRS/IN2P3
4, rue Kastler, F-44072 Nantes, France

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The influence of the Delta lifetime to kaon flow is investigated within the framework of the QMD model.

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The production of K mesons in heavy ion collisions is presently one of the most challenging topics in nuclear physics. At beam energies below or close to the threshold (in NN collisions $E_{\rm beam} = 1.583$ GeV) we observe a strong enhancement of the kaon production as compared to the extrapolation of pp collisions. Detailed investigations have shown that most of the K's are created in two step processes via an intermediate Δ or π and are produced at a density well above the normal nuclear matter density [1,2]. This triggered the conjecture that K's may be of use as a messenger of the high density zone. A lot of efforts have been recently done to describe the behaviour of kaons in dense nuclear matter. Especially the directed in-plane (anti)flow of kaons has been proposed to be a good observbable for studying the in-medium interactions of kaons [3]. In this contribution we want to demonstrate that also other effects like *e.g.* the Delta lifetime influence this dynamic. We use for this pupose the Quantum Molecular Dynamics Model (QMD) [4].

Flow effects of kaons may be caused by different effects: First a flow may already be induced in the moment of the production of the kaon. We will call this flow primordial flow. Afterwards the kaon may change their momenta due to rescattering effects and potential interactions with the medium. Concerning the primordial flow we see in Fig. 1 that the flow of the sources

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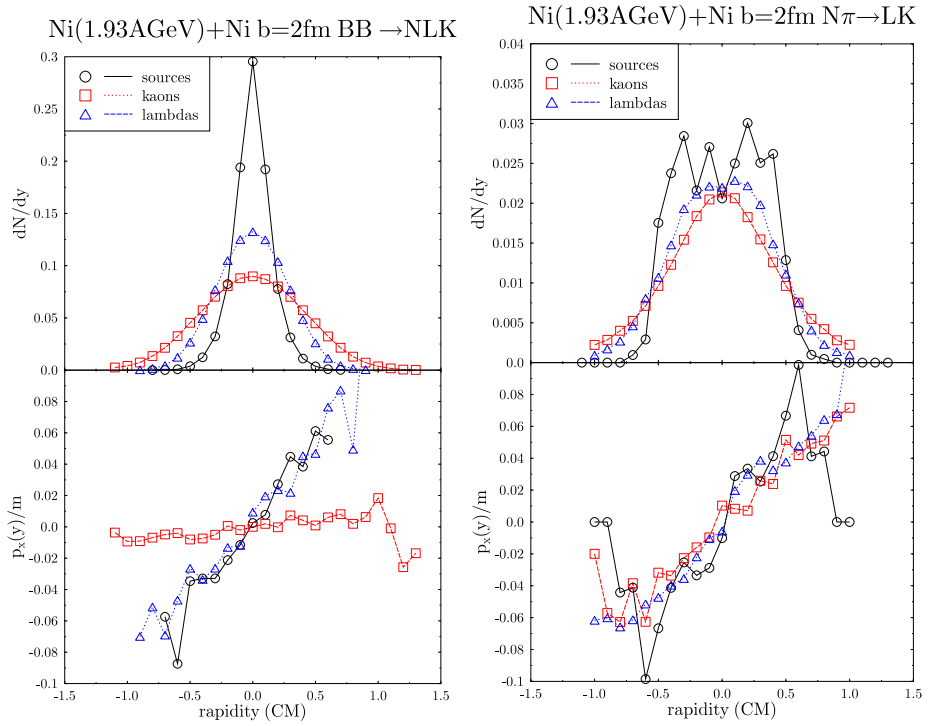

Fig. 1. Rapidity distribution and primordial flow of the sources and of the produced kaons and Lambdas steming from 3-body (left) and 2-body (right) channels.

$p_x = \sum p_x^i$ with i = particles in the init channels is quite low due to the kinematics of the reaction. In 3-body channels ($BB \rightarrow NYK$) this flow even is no more handed to the produced kaons due to the kinematics of the 3-body decay. In 2-body collisions, however, this flow of the sources caused a primordial flow of the kaons.

Therefore the decomposition of the kaon production into two and three-body channels may influence the primordial flow. A crucial role in this game is taken by the Delta, which feeds dominantly the the 3-body channels. Its decay product (the pion), however, feeds the 2-body channel. Therefore the lifetime of the Delta can influence the contribution of both channels as demonstrated in Fig. 2. Here we see on the left hand side its influence on the contribution to the $N\pi$ channel and to the total primordial kaon flow. A small Delta decay width Γ yields a large lifetime and therefore suppresses the 2-body channels. The opposite is found for a large Delta decay width. The correct description of the Delta lifetime has recently gained new interest [6]. An example of different parmetrisations is shown on the r.h.s of figure 2. Here we used the parametrisation of Huber (Γ_H), the phaseshift

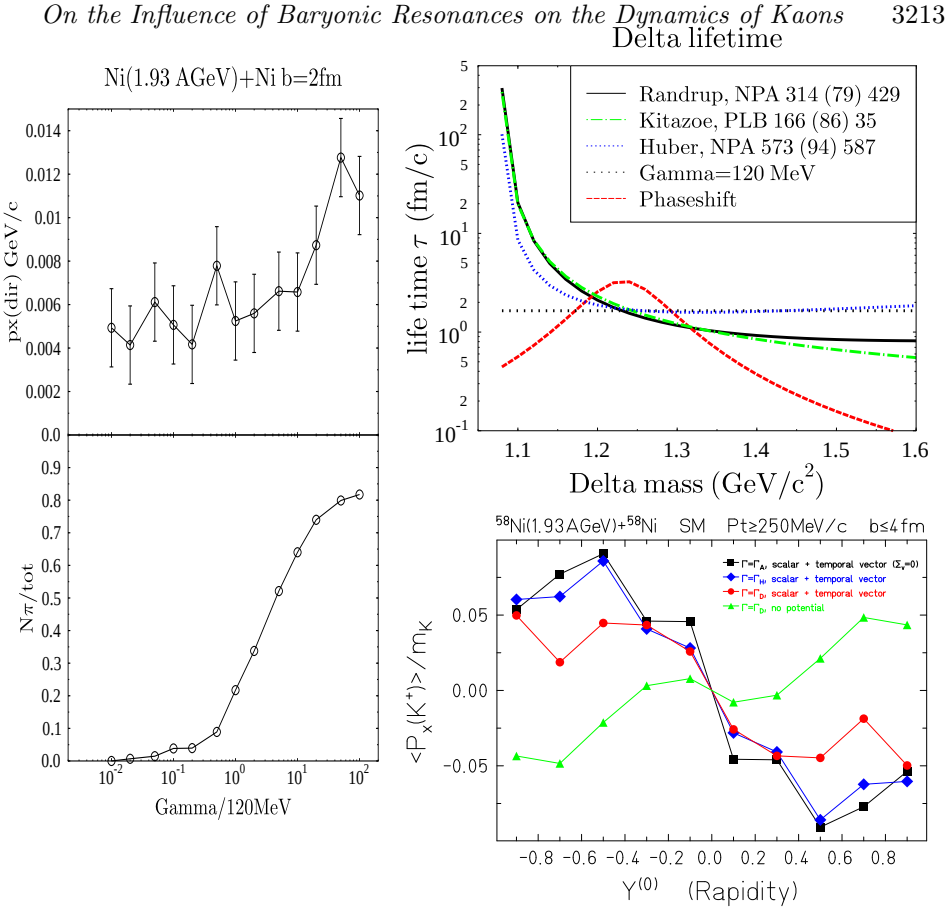

Fig. 2. Influence of the Delta lifetime on the kaon flow and on the contribution of $N\pi \to YK$ (left), different parametrisations of the Delta lifetime (right, top) and influence on the final kaon flow (right, bottom) in comparison to FOPI-data [7]

parametrisation (Γ_A) and a novel recompilation of the phaseshift parametrisation (Γ_D). The result of these parametrizations are shown in the bottom of Fig. 2. Here the kaons have been treated with full kaon potentials (derived from [5]) and rescattering. We see that after the interaction the influence of the Delta lifetime to the primordial flow is still visible. Therefore we would like to stress the importance of the correct treatment of the dynamics of nuclear resonances additionally to the description of the kaon interactions with the nuclear medium. However, a conclusive comparison to data is still premature.

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